

## MEMORANDUM TO MEMBERS OF THE NATIONAL SCIENCE BOARD

**SUBJECT:** Summary Report of the October 2-3, 2007 Meeting

The major actions of the National Science Board (Board) at its 400th meeting on October 2-3, 2007 and a preliminary summary of the proceedings are provided. This memorandum will be publicly available for interested parties to review. A more comprehensive set of Board meeting minutes will be posted on the Board's public Web site (<http://www.nsf.gov/nsb/>) following Board approval at the December 2007 meeting.

### 1. Major Actions of the Board (not in priority order):

- a. The Board approved the minutes of the Plenary Open Session (NSB-07-93) for the August 2007 meeting (<http://www.nsf.gov/nsb/meetings/2007/0807/minutes.pdf>). Minutes for the Plenary Executive Closed and Closed Sessions for the August 2007 meeting of the Board were also approved.
- b. The Board approved a resolution to close portions of the upcoming December 5-6, 2007 Board meeting dealing with staff appointments; future budgets; grants and contracts; specific Office of the Inspector General investigations and enforcement actions; and National Science Foundation (NSF) participation in a civil or administrative action, proceeding, or arbitration (<http://www.nsf.gov/nsb/meetings/2007/1205/closing.pdf>).
- c. The Board authorized the Director, at his discretion, to make awards to Incorporated Research Institutions for Seismology (IRIS), UNAVCO, Inc., and Stanford University for EarthScope Facility Operations and Maintenance during FY 2008 - FY 2012.
- d. The Board approved the *National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering, and Mathematics Education System*, subject to minor edits approved by the Chairman of the Board and the chairman of the Committee on Education and Human Resources (pre-publication copy, NSB-07-114) ([http://www.nsf.gov/nsb/edu\\_com/draft\\_stem\\_report.pdf](http://www.nsf.gov/nsb/edu_com/draft_stem_report.pdf)).
- e. The Board approved the draft report, *International Science and Engineering Partnerships: A Priority for U.S. Foreign Policy and Our Nation's Innovative Enterprise* (draft for public comment, NSB-07-10) to be released for public review and comment, subject to minor edits approved by the Chairman of the Board and the chairman of the Task Force on International Science ([http://www.nsf.gov/nsb/publications/2007/draft\\_isep\\_nsb0710.pdf](http://www.nsf.gov/nsb/publications/2007/draft_isep_nsb0710.pdf)).

- f. The Board approved the draft report, *Moving Forward to Improve Engineering Education* (NSB/EHR-07-8), subject to minor edits approved by the Chairman of the Board and the *ad hoc* Engineering Education Group.
- g. The Board approved the Overview Chapter of *Science and Engineering Indicators 2008*.
- h. The Board approved the “Digest of Key S&E Indicators” for *Science and Engineering Indicators 2008*” (NSB/SEI-07-11) subject to final edits approved by the Chairman of the Board and the chairman of the Subcommittee on Science and Engineering Indicators.
- i. The Board approved the topic relating to “research and development and U.S. competitiveness in a global economy” for the Companion Piece to *Science and Engineering Indicators 2008*.
- j. The Board approved the Subcommittee on Science and Engineering Indicators’ proposal to hold roundtable discussions and workshops related to planning for *Science and Engineering Indicators 2010*.
- k. The Board approved the use of an e-mail polling process for Board approval of the NSF management response to the Inspector General’s Semiannual Report, the Board Chairman’s transmittal letter, and the transmittal of Semiannual Report package, which is due to Congress by December 1, 2007 prior to the next Board meeting on December 5-6, 2007.
- l. The Board approved a statement to affirm the role and responsibilities of the Board Chairman.
- m. The Board approved the statement to re-affirm the previous Board decision regarding the ability to seek legal and statutory interpretations and support.
- n. The Board approved a revision to the Board thresholds policy.
- o. The Board approved establishment of the Committee of Programs and Plans, Task Force on Sustainable Energy (Charge, NSB-07-121) with co-chairmen Drs. Dan Arvizu and Jon Strauss. (Task force members will be appointed in the near future.) (Attachment 1)
- p. The Board approved establishment of the Committee on Strategy and Budget, Task Force on Cost Sharing (Charge, NSB-07-110). (Task force chairman and members will be appointed in the near future.) (Attachment 2)
- q. The Board Chairman established the *ad hoc* Committee for the Vannevar Bush Award with Dr. Kathryn Sullivan, chairman, and Drs. Kelvin Droegemeier, Patricia Galloway, José-Marie Griffiths, and Thomas Taylor.
- r. The Board Chairman discharged the *ad hoc* Committee on Nominations for NSB Class of 2008-2014 with thanks to Dr. Wayne Clough, chairman, and Drs. Daniel Hastings, Elizabeth Hoffman, Alan Leshner, and Douglas Randall.

## 2. Board Chairman's Report

Dr. Steven Beering, Board Chairman, noted that October 2007 marked the 400th meeting of the Board. For nearly 60 years, the Board has served as both the policy setting and oversight body for NSF. The Board is also an independent body of advisors to the President and Congress on national policy issues related to science and engineering research and education. The Board has made significant accomplishments through the decades – a sampling of which is reflected in the actions of the past year where the Board: approved NSF's *Strategic Plan* and accepted NSF's *Facility Plan*; approved 13 funding approval actions; held 4 roundtable discussions and visits abroad relating to International Science; held 2 hearings relating to science, technology, engineering, and mathematics (STEM) education outside Washington, DC; held a workshop on Engineering Education; published a report on Hurricane Science, which offered recommendations for a national initiative; published a report on Transformative Research, which provided guidance for NSF; and most recently, the Board approved the National Action Plan for STEM Education, entitled, *A National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering, and Mathematics Education System*.

The National Action Plan for STEM Education was unveiled on Capitol Hill on Wednesday, October 3, 2007 and pre-publication copies were distributed. The Board was honored to have Congressmen Brian Baird, Vernon Ehlers, Michael Honda, Daniel Lipinski, and other congressmen attend this event and provide encouraging comments. Several members of the Board Commission on STEM Education and representatives of several STEM education stakeholder groups also attended the event.

On August 9, 2007, the President signed into law the America COMPETES Act, H.R. 2272, which provided for the re-authorization of NSF. (COMPETES: America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science.) The COMPETES legislation provided a clarification for the manner in which the Board communicates with Congress such that: "The Board shall render to the President *and* the Congress no later than January 15 of each even numbered year, a report on indicators of the state of science and engineering in the United States. The Board shall render to the President *and* the Congress reports on specific, individual policy matters related to science and engineering and education in science and engineering, as the Board, the President, or the Congress determines the need for such reports."

Other key points of the COMPETES legislation that directly affect the Board indicate that the Board: must submit to Congress a report of its evaluation of the role of NSF in supporting interdisciplinary research; shall evaluate and report to Congress on the impact of its policy to eliminate cost sharing; must submit to Congress a report of its evaluation of current NSF policy regarding preconstruction funding and maintenance and operation costs for Major Research Equipment and Facilities Construction (MREFC) projects; must submit to Congress a summary report of its findings, including any recommendations regarding changes to, the termination of, or the continuation of the NSF pilot program of grants for new investigators; and must submit to Congress a summary report of its findings, including any recommendations regarding changes to the current NSF policies on institutions limitations on the number of proposal submissions by a single institution of higher education.

Dr. Beering assigned the Board's standing committees to work on the above Board reports to Congress. The Committee on Programs and Plans (CPP) will lead: an evaluation of the role of NSF in supporting inter-disciplinary research; an evaluation of current NSF policy regarding preconstruction funding and maintenance and operation costs for MREFC projects; and a summary of findings to include any recommendations regarding changes to, the termination of, or the continuation of, the NSF pilot program of grants for new investigators. The Committee on Strategy and Budget (CSB) will lead: an evaluation on the impact of its policy to eliminate cost sharing; and a summary of findings to include any recommendations regarding changes to the current NSF policies on institutions limitations on the number of proposal submissions by a single institution of higher education.

Dr. Beering announced the establishment of the *ad hoc* Committee for the Vannevar Bush Award. This committee will select the recipient of the 2008 Vannevar Bush Award for "outstanding contributions toward the welfare of mankind and the Nation." He re-appointed last year's committee with Dr. Kathryn Sullivan, chairman, and members Drs. Kelvin Droegemeier, Patricia Galloway, José-Marie Griffiths, and Thomas Taylor. (See 1.q.) Also, the NSB Public Service Award Advisory Committee, which is a Federal Advisory Committee to the Board and not a Board committee, had been established and new members had been appointed. The Bush Award and the Public Service Award are presented at the Board's annual May dinner.

The Chairman discharged the *ad hoc* Committee on Nominations for the Class of 2008-2014, which completed its work, and thanked Drs. Wayne Clough, chairman, and Drs. Daniel Hastings, Elizabeth Hoffman, Alan Leshner, and Douglas Randall. (See 1.r.)

Dr. Sullivan, Board Vice Chairman, reported for the *ad hoc* meeting design group. She gave an update on options for Board meeting structure and scheduling, and presented a suggested calendar for future meetings of the full Board, retreat and site visit, and full-day meetings of CPP and CSB. The Board reached a consensus to move the date of its annual retreat, meeting, and site visit from February 2008 to October 2008. Dr. Michael Crosby, Executive Officer and Board Office Director, will develop the logistics for the October 2008 activities to be held at the University of Alaska at Fairbanks, and poll Board Members regarding availability for scheduling of additional meeting timeframes.

Finally, Dr. Beering recognized the following Board Members: Dr. Galloway recently published a book entitled, *The 21<sup>st</sup> Century Engineer*, which addresses the skill sets that an engineer of the 21st century needs to survive and a suggested curriculum for a master's degree in professional engineering management. Dr. Karl Hess was recently named to the Hawaii Innovation Council by the Governor of Hawaii. Dr. Hess is one of 18 distinguished people who will advise Governor Linda Lingle on ways to improve the economic impact of Hawaii's innovation resources, including technology research, development, and product creation. Dr. Louis Lanzerotti was recently named as the new chairman of the Governing Board of the American Institute of Physics (AIP). The AIP promotes the advancement and diffusion of the knowledge of physics and its application to human welfare.

### **3. NSF Director's Report**

Dr. Arden Bement, NSF Director, introduced Dr. Marc Rothenberg, who began serving as the NSF Historian in December 2006 with the Office of Legislative and Public Affairs (OLPA). Prior to his arrival, he was the editor of the Joseph Henry Papers Project at the Smithsonian Institution. He received his Ph.D. from Bryn Mawr College in History and Philosophy of Science.

On Friday, September 28, 2007, the Office of Personnel Management announced that two NSF employees were selected as recipients of the Presidential Distinguished Rank Awards for 2007: Dr. John "Jack" Lightbody, Deputy Assistant Director for the Mathematical and Physical Sciences Directorate (MPS), and Ms. Mary Santonastasso, Division Director, Division of Institution and Award Support, Office of Budget, Finance, and Award Management (BFA). These individuals were selected by the President for their exceptional leadership, accomplishments, and service over an extended period of time.

For the congressional update, Dr. Bement reported on two hearings. The House Science and Technology Subcommittee on Research and Science Education held a hearing on October 2, 2007 regarding Nanotechnology education. Testimony was provided by Mr. David Ucko, NSF Deputy Division Director, Education and Human Resources Division on Research and Learning. Also, the House Science and Technology Committee would consider a hearing on October 17, 2007 on "Women in Science and Engineering" - especially aimed at looking at the National Academies of Science report "Beyond Bias and Barriers." Dr. Kathie Olsen, NSF Deputy Director, would testify. Copies of the NSF Director's congressional update, which included information on bills of interest to NSF, were provided to Board Members.

### **4. Board Committee Reports**

(Note: The Executive Committee did not meet in October 2007.)

#### **a. Audit and Oversight (A&O) Committee**

##### A&O Open Session

Dr. Arvizu, A&O chairman, met with NSF and Office of Inspector General (OIG) staff regarding the status of the Raytheon audit corrective action plan, and expressed confidence that progress was being made with this complex situation. Actions that are within the control of NSF should be finalized by the end of the year, most before the December 2007 Board meeting. The Program Fraud Civil Remedies Act was amended in August 2007 to include the NSF. OIG worked to obtain this authority for the agency, and the Board had sent a letter to Congress in March 2006 formally requesting this action. This amendment provides NSF with an administrative vehicle to pursue recovery of losses resulting from fraud cases under \$150,000 when the Department of Justice declines civil or criminal False Claims Act prosecution. As a result, agency recoveries in small dollar fraud cases should be significantly enhanced.

Dr. Crosby proposed a process by which the Board can approve the transmittal of the OIG Semiannual Report package to Congress without holding a meeting. Due to timing issues, it was not possible for the Board to conduct this business at the December 5-6 2007 meeting. Therefore, the committee approved a process outlined by Dr. Crosby, which involved polling

Board Members by e-mail during November 2007 to obtain approval of the Chairman's cover memorandum and the transmittal of the OIG Semiannual Report package to Congress. *[The full Board subsequently approved the use of an e-mail polling process for Board approval of the NSF management response to the OIG Semiannual Report, the Board Chairman's transmittal letter, and the transmittal of the Semiannual Report package, due to Congress by December 1, 2007.]* (See 1.k.)

The committee approved the following statement to affirm the role and responsibilities of the Board Chairman as prepared by Dr. Hoffman with input from Board Members.

The Board affirms the role of its Chairman to represent the Board by presenting or otherwise communicating established Board policies, positions, or programs. When taking such actions, the Chairman should, to the extent possible, seek input from other Board members, Board staff, and appropriate National Science Foundation staff; and promptly inform the Board of any such actions. These duties are in addition to those specifically provided or contemplated for the Board Chairman by statute. *[The full Board subsequently approved the above statement to affirm the role and responsibilities of the Board Chairman.]* (See 1.l.)

Drs. Ray Bowen and Patricia Galloway, as requested by the committee chairman at the August 2007 meeting, consulted other Board Members and developed a position for the committee to consider on the issue of the Board obtaining legal services. Dr. Bowen recommended, and the committee approved, the following:

The Board re-affirms the previous Board decision not to establish a separate General Counsel for the Board, and further re-affirms that the Board has and retains the ability to seek legal and statutory interpretations and support for research on such issues by individuals and/or organizations outside the NSF Office of General Counsel, outside NSF and outside the Federal agencies. *[The full Board subsequently approved the above statement to re-affirm the previous decision regarding the ability to seek legal and statutory interpretations and support.]* (See 1.m.)

Mr. Thomas Cooley, NSF Chief Financial Officer, discussed the progress that has been made on addressing the reportable conditions from the FY2006 audit and the status of the FY 2007 financial statements and performance reporting. Mr. Salvatore Ercolano, Partner-in-Charge with Clifton Gunderson LLP, confirmed that the audit was on track and that communication was good.

Dr. Emily Woodruff, OIG, introduced the FY 2008 Audit Plan. Twenty of the audits, or 41 percent of the audit work in this year's plan, was either requested by NSF or required by law. The balance of the audits was OIG initiated. Some examples of OIG-initiated audits include: reviews of time and effort reporting practices, large facility cooperative agreements, and NSF's contingency planning efforts.

#### A&O Closed Session

Information was presented to the committee on several ongoing investigations.

## **b. Education and Human Resources (EHR) Committee**

The committee approved the *National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering, and Mathematics Education System* (NSB-07-114), subject to minor edits. [The full Board subsequently approved this report, subject to minor edits approved by the Board Chairman and the EHR chairman.] (See 1.d.)

Dr. Crosby noted that he will contact Congressman Rush Holt's staff and report to the committee at the December 2007 meeting to follow up on the request for a report on the Board's review of NSF EHR programs with respect to evaluation procedures.

Dr. Cora Marrett, Assistant Director for the Education and Human Resources Directorate, spoke on the impact of the America COMPETES Act on the NSF EHR portfolio. Dr. Marrett noted that the NSF review of the act is in a preliminary stage, and that it would have broad impact in a number of areas across NSF with a heavy focus on STEM education programs.

The committee heard reports from Board Members, Drs. Camilla Benbow and Jo Anne Vasquez, on topics of interest and new directions for the EHR Committee. Dr. Benbow addressed issues on "Fostering STEM Innovators," noting the importance of the issues relative to workforce development. Dr. Vasquez spoke on the "Involvement of Higher Education STEM Faculty in Preparing K-12 Teachers," and issues related to rewards and balance for young faculty. Dr. Hoffman noted that the STEM Commission did not address how to foster the next generation of innovators and, as workforce issues are of national interest, the committee might discuss how to go forward to develop and stimulate STEM innovators. She asked Dr. Benbow to follow up on this topic by preparing a proposed charge for EHR to be presented at the December 2007 meeting that would establish a group to make recommendations to NSF on ways to improve the education of the next generation of STEM innovators.

## **c. EHR Subcommittee on Science and Engineering Indicators (SEI)**

The subcommittee presented four motions for EHR Committee approval relating to *Science and Engineering Indicators* (Indicators). The EHR Committee approved the following motions: the Overview Chapter of *Indicators 2008*; the "Digest of Key Science and Engineering Indicators" for *Indicators 2008*; the development of a Companion Piece for *Indicators 2008* on the general topic of "research and development and U.S. competitiveness in the global economy;" and formal action to hold roundtable discussions and workshops in connection with *Indicators 2010*. [The full Board subsequently approved the above four items.] (See 1.g. - 1.j.)

## **d. EHR ad hoc Task Group on Engineering Education**

Since the August 2007 meeting, final comments were received from Board Members on the draft Engineering Education report, *Moving Forward to Improve Engineering Education* (NSB/EHR 07-8). The task group and the EHR Committee approved the report, subject to final edits, for publication and dissemination. [The full Board subsequently approved this report subject to final edits approved by the Board Chairman and the ad hoc Engineering Education Group.] (See 1.f.)

## **e. Committee on Programs and Plans (CPP)**

### CPP Open Session

Three reporting actions required by the America COMPETES Act assigned to CPP by the Chairman of the Board (see Chairman's Report) were reviewed. Two items will be taken under consideration by the full committee. The committee discussed the third item, evaluating current NSF policy regarding preconstruction planning and maintenance and operations costs of facilities, during the discussion of facilities operations and maintenance costs, and concluded that Dr. Mark Abbott will form an *ad hoc* group to combine these two activities and work quickly to develop a draft Board response to Congress.

Dr. Lanzerotti presented an update on the Board policy on recompetition of NSF awards, and is working with the Board Office to develop policy options for the committee to consider at the December 2007 meeting.

NSF presented a proposal to change the threshold policy for bringing funding actions to the Board. The committee approved the following revision to the policy.

The National Science Board approved a change to Board policy such that NSF directorates and offices would be required to bring forward for Board approval proposed awards where the average annual award amount is 1 percent or more of the awarding directorate/office's prior year current plan or \$3,000,000, whichever is greater.

*[The full Board subsequently approved the revised threshold policy.] (See 1.n.)*

Finally, CPP heard two information reports on the following topics: Deep Underground Science Engineering Laboratory (DUSEL) and Advanced Laser Interferometer Gravitational Wave Observatory (AdvLIGO). DUSEL is an underground laboratory space that will provide infrastructure for science and engineering research. NSF informed the committee of the rigorous selection process for this facility, including the current solicitation to develop technical designs for an initial suite of experiments. AdvLIGO is an upgrade to LIGO that will enhance the capability of the existing facility. It has recently conducted successful baseline and readiness reviews.

### CPP Closed Session

The committee considered and approved the following action item.

*EarthScope Facility Operations and Maintenance: FY 2008 – 2012, Incorporated Research Institutions for Seismology (IRIS), UNAVCO, Inc. and Stanford University (NSB-07-97).* *[The full Board subsequently approved the above resolution.] (See 1.c.)*



**f. CPP Subcommittee on Polar Issues (SOPI)**

Dr. Karl Erb, Director, Office of Polar Programs (OPP), reported on a recent opening ceremony for the start of the Antarctic operating season and compared the early season ice edge this year with that of the previous 2 years. The significant shift southward of the ice edge will enable much easier access to McMurdo this season. Dr. John Lightbody, Program Manager for the IceCube Neutrino Observatory (IceCube), provided an overview of progress-to-date and the current status of the construction project. He summarized the scientific capabilities the observatory will enable, cost and schedule performance, and contingency history. Construction on IceCube is 76.7 percent complete and operations are underway.

**g. CPP Task Force on International Science (INT)**

The task force and CPP approved the draft report, *International Science and Engineering Partnerships: A Priority for U.S. Foreign Policy and Our Nation's Innovative Enterprise (NSB-07-10)* for release for public review and comment. *[The full Board subsequently approved this publication to be released for public review and comment, subject to minor edits approved by the Board Chairman and the chairman of the Task Force on International Science.]* (See 1.e.)

**h. CPP Task Force on Transformative Research (TR)**

Dr. Bement presented the additional developments of NSF's transformative research initiative strategy in response to the Board's TR report, *Enhancing Support of Transformative Research at the National Science Foundation (NSB-07-32)*. Since the August 2007 meeting, NSF issued Important Notice 130 on the subject of Transformative Research, established a Working Group on Transformative and Inter-disciplinary Research, Solicited for Cyber-Enabled Discovery and Innovation, and developed enhanced Merit Review training. NSF's next steps include: implementation of change to the Intellectual Merit Review Criterion that will need to provide guidance to reviewers and panels, development of new funding mechanisms, implementation of a merit review course, and continued activities promoting potential transformative research throughout NSF.

**i. CPP Task Force on Sustainable Energy**

Drs. Jon Strauss and Dan Arvizu briefed CPP on the activities of the *ad hoc* Task Group on Sustainable Energy including a recent summit on sustainable energy held at the White House. CPP approved the charge to create a formal Task Force on Sustainable Energy (NSB-07-121). *[The full Board subsequently approved the charge to the Task Force on Sustainable Energy.]* (See 1.o.) (Attachment 1)

**j. Committee on Strategy and Budget (CSB)**

The committee is tasked with drafting Board responses to two sections of the America COMPETES Act: cost sharing, and the impact of limiting the number of proposals from an institution.

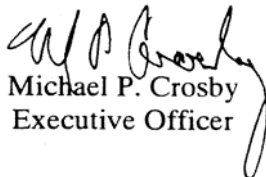
Dr. Joanne Tornow, Chairman of the NSF Impact of Proposal and Award Management Mechanisms (IPAMM) Working Group, presented a status update on the Report of the NSF Working Group on the IPAMM. NSF is developing strategies, based on IPAMM findings and recommendations that are appropriate within the context of NSF organizations. NSF will update the Board annually on trends identified in the IPAMM study and assessments of related practices and policies of directorates and research offices.

Dr. Bowen, CSB chairman, summarized the Board's long-standing interest and efforts to develop recommendations on NSF average award size, duration, and proposal success rate. He invited Dr. Bement to review draft guidance from the November 2005 CSB meeting and offer suggestions based on IPAMM findings. Drs. Bowen and Droegemeier will work with Dr. Bement to revise the draft guidance and bring it to CSB at the December 2007 meeting for action.

Dr. Bement provided a status report on the FY 2008 budget request. NSF is currently operating under a continuing resolution (CR) that runs through mid-November 2007, and no new programmatic starts are allowed under the CR.

#### **k. CSB Task Force on Cost-Sharing**

As part of the NSF reauthorization act, America COMPETES, Congress asked the Board to submit a report on the issue of cost sharing. CSB approved the charge to create a Task Force on Cost Sharing (NSB-07-110) to draft a report for the Board. *[The full Board subsequently approved the charge to the Task Force on Cost Sharing.]* (See 1.p.) (Attachment 2)

  
Michael P. Crosby  
Executive Officer

#### Attachments:

- (1) NSB-07-121, Charge to the Task Force on Sustainable Energy
- (2) NSB-07-110, Charge to the Task Force on Cost Sharing

## Charge to the Task Force on Sustainable Energy

### Statutory Basis

"The Board shall render to the President and to the Congress reports on specific, individual policy matters related to science and engineering and education in science engineering, as the Board, the President, or the Congress determines the need for such reports." (42 U.S.C. Section 1863) SEC. 4. (j) (2)

### Action Recommended

The National Science Board (Board) will examine the role of the U.S. Government in addressing the science and engineering (S&E) challenges related to development of sustainable energy, and provide recommendations to the President and Congress regarding a nationally coordinated S&E research and education initiative on sustainable energy with specific guidance on the role of the National Science Foundation (NSF) in such an initiative.

### Background

The interest of the National Science Board in sustainable energy was encouraged by President George W. Bush's national call to action on energy with the announcement of the Advanced Energy Initiative in his January 31, 2006 State of the Union Address. The rapidly expanding literature warns of a number of threats from our Nation's and the World's reliance on fossil energy sources. These include:

- the economic and societal impacts of a rapidly growing global demand for energy and the increasing costs, both economic and environmental, of fossil fuel as the more easily accessible sources are depleted,
- the threat to national security and balance of trade as the U.S. and other countries, especially emerging economies, become increasingly dependent on a relatively few, often politically unstable, oil exporting nations, and
- the often cited threat of anthropogenic carbon loading in the atmosphere and its effects on the global climate and on human life.

These threats have given rise to a global call to move rapidly to a sustainable energy economy. However, most projections of trends for the next quarter to half century suggest little change in the future global energy mix without more concerted action. It is of concern that the scale and speed of the adoption of sustainable and clean energy technologies will be far short of that necessary to address the threats that will only become more acute with the passage of time. Of particular concern is the heavy dependence on fossil fuels for the transport sector and the carbon footprint that current and projected energy use represents.

Given the Board's responsibility to advise the President and Congress on national policy matters relating to science and engineering, the Board arranged for three expert presentations on the scientific challenges related to the development of sustainable energy:

- *Energy from Biomass*, Chris Somerville, Professor of Biological Sciences, Stanford University, September, 2006;
- *Scientific Challenges in the Development of Sustainable Energy*, Nathan S. Lewis, Professor of Chemistry at Caltech, November, 2006; and
- *Transformational Science for Energy and the Environment*, Raymond L. Orbach, Under Secretary for Science, U.S. Department of Energy, March, 2007.

The Board is also mindful of President Bush's challenge to the nation in his 2007 State of the Union Address: *"America is on the verge of technological breakthroughs that will enable us to live our lives less dependent on oil. And, these technologies will help us be better stewards of the environment, and they will help us to confront the serious challenge of global climate change."*

These presentations and the President's challenge energized the Board regarding the immediacy of the need to develop sustainable energy sources that would lessen the dependence on increasingly difficult to access fossil fuels and decrease the rate of atmospheric carbon loading. Given the vital strategic importance of energy use in carrying out the missions of most government agencies, the Board believes it to be an imperative for the long-term prosperity of this Nation for the government to develop a long-term, coordinated, inter-agency strategy to achieve a stable sustainable U.S. energy future. Such an approach will require that the attributes of a sustainable energy economy be defined and that all technology options be weighed and evaluated against their ability to meet these attributes. Further, this would need to be done in a global context. The Board is uniquely suited to make recommendations regarding the S&E research and education challenges in developing such a nationally coordinated strategy, with specific guidance to NSF on its role in this effort. The Board's Committee on Programs and Plans (CPP) should establish a formal Task Force on Sustainable Energy to lead this Board effort.

#### Policy Objectives

The following issues will be analyzed and discussed by the Task Force before constructive policy recommendations and a proposed strategy is recommended to CPP and the full Board consistent with the Board's statutory charge.

- Examine existing S&E sustainable energy research and education policies and efforts at the NSF, the Federal Government and U.S. corporations, and around the world in scope, scale, time frame, and in the context of national and global challenges.
- Develop recommendations for the Board to consider with respect to a nationally coordinated S&E research and education initiative on sustainable energy.
- Provide explicit guidance on NSF's role with respect to basic research and education in the overall national effort.

Based upon the work of this Task Force, the Board will then provide policy guidance to NSF, and broader recommendations to the Administration and Congress relative to a long-term coordinated inter-agency strategy for the development of sustainable U.S. energy production in light of President Bush's challenge to be better stewards of the environment.

#### Logistics

Once the Task Force has completed its initial analysis of existing policies and efforts, the Task Force will bring together representatives of NSF, academe, private sector industry and investors, NGOs, and other pertinent U.S. Federal agencies involved in energy, as well as members of the broader scientific community, through a series of workshops to examine, discuss and address the issues identified above. The Task Force will have the ability to convene such working groups as it deems necessary to obtain additional relevant information as well as to frame recommended strategies. It is anticipated that the Task Force will produce a final report that summarizes its findings and presents recommendations regarding the role of the U.S. Government in addressing S&E challenges related to development of sustainable energy, with specific recommendations for the NSF role in a national S&E research and education initiative on sustainable energy. Printed copies of a final Board report will be widely distributed and available on the Board Web site for the general public, universities, Congress, various special interest groups, and the broad scientific community. In addition, a regular and pro-active outreach effort to communicate task force activities will be implemented throughout the duration of the Task Force life. The Task Force expects to present a draft report to the Board in 12 months, and conclude its activities within 18 months, from the date that formation of the Task Force is approved. The Board Office will serve as the focal point for coordination and implementation of all Task Force activities.

### **Charge to the Task Force on Cost Sharing**

#### Statutory Basis

“The Board shall render to the President and the Congress reports on specific, individual policy matters related to science and engineering and education in science and engineering, as the Board, the President, or the Congress determines the need for such reports.” (42 U.S.C. 1863(j)(2); and HR 2272)

#### Action Recommended

The National Science Board (Board) will examine National Science Foundation (NSF) cost sharing and institutional commitment policy, specifically focusing on the consequences of the Board’s 2004 revision to cost sharing policy that eliminated NSF program-specific cost sharing requirements and required only the statutory one percent of sharing.

#### Background

The Board has been involved with the issue of “cost sharing” since the Bureau of the Budget (predecessor of the Office of Management and Budget [OMB]) requested on September 15, 1954 assistance in setting uniform policies for indirect costs for research grants from Federal agencies. As defined in OMB Circular A-110, cost sharing refers to the contribution of quantifiable and auditable assistance from non-NSF (and non-Federal) sources to NSF-supported activities. Congressional statutory requirements dictate that the recipient of an NSF award resulting from an unsolicited proposal cost share a minimum of one percent on the project or a minimum of one percent of the aggregate costs of all NSF-supported projects subject to the statutory requirements. Prior to October 2004, specific programs could set cost sharing requirements for solicited proposals in addition to the statutory one percent requirement. Revisions to the Board’s cost sharing policy in 1999 and 2002 made it clear that cost sharing is an eligibility criterion rather than a review criterion.

On October 14, 2004, the Board approved its most recent cost sharing policy revision, eliminating NSF program-specific cost sharing requirements and requiring only the statutory one percent of sharing. This revision eliminated cost sharing as an eligibility requirement for grant proposals. This decision may have produced some unintended consequences. The America COMPETES Act (H.R. 2272), signed into law on August 9, 2007, directed the Board to evaluate and report to Congress on the impact of its policy to eliminate cost sharing for existing programs that were developed around industry partnerships and that historically required industry cost sharing. It further directed the Board to consider the impact that this cost sharing policy has on the initiation of new programs for which industry interest and participation are sought.

#### Policy Objectives

The *ad hoc* Task Group on Cost Sharing recommends that the Board approve the creation of a formal Task Force on Cost Sharing under the Committee on Strategy and Budget (CSB). The following issues will be analyzed and discussed before constructive policy recommendations are brought to CSB and the full Board:

- Requirement of cost sharing in NSF programs, with specific emphasis on programs developed around industry partnerships and programs that historically required cost sharing.
- Role and impact of institutional commitment in NSF programs, defined as voluntary cost sharing (cash or in-kind) provided by an institution for NSF proposals.
- Impact of cost sharing and/or institutional commitment in the review process of proposals for NSF awards.
- Mechanisms and workload, by both NSF and grantee institutions, involved with verifying expenditure of committed non-NSF funds.
- Impact of cost sharing and/or institutional commitment on broadening participation in NSF-funded research.

The task force will seek to contextualize its discussions and recommendations, and the analysis used in developing those recommendations, in broader terms of indirect costs and the overall costs borne by institutions in conducting

research. The task force will make use of objective, quantitative data available from NSF and previous studies on cost sharing, and will seek to assemble new objective, quantitative information from various constituency groups. The task force will analyze this information in the context of differing philosophies and objectives by involving constituencies that have different views on cost sharing.

Based upon the work of this task force, the Board will then provide guidance to NSF and make recommendations to the Administration and Congress on future policy and actions with respect to cost sharing and institutional commitment policy for application at NSF.

Logistics

A series of workshops and roundtable discussions will be used by the task force to gather relevant information from academic and other NSF-funded institutions (to include faculty, vice presidents/chancellors for research, and presidents), representatives from U.S. Federal agencies, legislators, and NSF staff, as well as members of the broader scientific and industry communities. Members of the task force may also attend previously scheduled meetings/conferences of academic/scientific societies to discuss cost sharing with various stakeholder groups. A survey on cost sharing may be developed by the task force, within appropriate federal regulations, and distributed to key stakeholders. The purpose of these activities will be to better inform the task force as it develops draft cost sharing policy for full Board review. It is anticipated that the task force will produce a final report that synthesizes the contributions from its own deliberations, previous studies, and survey results, and that it will present recommendations regarding cost sharing and institutional commitment for application at NSF. Printed copies of a final Board report will be widely distributed and made available on the Board Web site for all interested parties. The following is a tentative general timeline for task force activities:

October 3	Discussion of Task Force charge and approval by full Board
October-November	Finalize plans for surveying stakeholders; execute stakeholder survey including quantitative analysis
November-January	Workshops and roundtable discussions and/or Board member/staff attendance at scheduled academic/scientific society conferences to discuss cost sharing with stakeholders
December 5	Task Force meeting as part of Board meeting to discuss survey data and possible recommendations; provide initial thoughts to Board
Early January	Draft preliminary report of initial recommendations shared via email and conference call to further discuss recommendations
Mid-January	Initial review and comment of preliminary report by Board via e-mail
Late January	Revise draft preliminary report and submit to Board
February 6, 2008	Board votes on preliminary report for Congress
Early/mid-February	Preliminary report delivered to Congress
February-May	Develop and approve final report for Congress
Mid-May	Final report delivered to Congress

A regular and proactive outreach effort to communicate task force activities will be implemented throughout the duration of the task force life. The task force expects to conclude its activities within 12 months from the date that formation of the task force is approved. The Board Office will serve as the focal point for coordination and implementation of all task force activities.